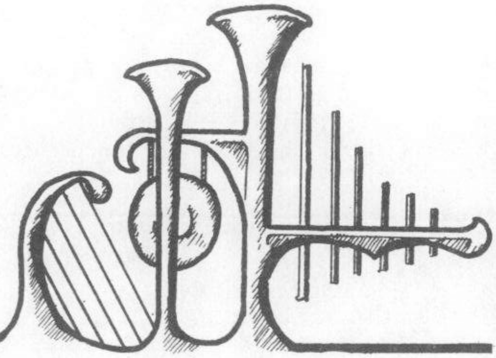
EXPERIMENTAL MUSICAL INSTRUMENTS



NEWSLETTER FOR THE DESIGN, CONSTRUCTION & ENJOYMENT OF NEW SOUND SOURCES

Volume I Number 1 June, 1985

WHAT THIS IS ABOUT -- OUR PURPOSE AND OUR PLANS

Experimental Musical Instruments is for people interested in new and unconventional musical sound sources. Instrument designers, builders and players, composers, acousticians, scholars and, I think, anyone with an adventurous turn of mind will find something of value here. We will look at a very wide range of instruments: instruments made with strings, membranes, air, water, wood; in short, with whatever materials and vibrating devices an imaginative builder can come up with. Some of these will be instruments that could be used in conjunction with a conventional approach to music and notation, while others may look to entirely new musical forms. Electrically amplified acoustic instruments will be fair game, but we will not be dealing with synthesizers and similar purely electronic devices. We will avoid promoting any specific musical orientation beyond an appreciation for new and unusual sound sources.

You can expect to see articles on:

specific new instruments and the work of individual builders,

older instruments of interest to new instruments people,

tools, techniques and materials,

acoustics of musical instruments,

composing for new instruments, recording them, marketing them,

plus guides to bibliographic and discographic resources, performances and events.

There is a great deal of activity in creative instrument building going on currently, with an array of builders doing diverse and fascinating work. But it is easy for instrument designers and builders to find themselves working in isolation. It is difficult for them to learn what other builders are doing and equally difficult to let those who would value it know of their work. Composers have no central information source devoted to acoustic sound sources newly available for use in their scores; performers likewise have no central resource for new instruments to incorporate in their work. **Experimental Musical Instruments** will help fill the gap. If all goes well this newsletter will serve as an open forum and network of exchange for the people, scattered all over the country, who have recognized what a wonderfully rich world of sound is there for us if we bring imagination and some hard work to the task.

I hope that you, the readers, will not be just readers. You can help the newsletter serve everyone well. Please write letters, submit articles, express opinions, call up and complain about this or that; let us know what you and people you know of are up to, and inform us of goings-on the readers should know about.

I think this newsletter is going to be a lot of fun. Thanks for joining us.

LETTERS

Experimental Musical Instruments will be printing letters from readers as they come in. We strongly encourage anyone with something to say to write. We are always interested in hearing what readers are doing and thinking. Your communication with us is also an effective means of communicating with the readership as a whole.

SUBMISSIONS

Experimental Musical Instruments welcomes submissions of articles relating to new instruments. Articles about one's own work are especially appropriate. Smaller articles may be sent, with return envelope, directly to the newsletter. Send a query letter before undertaking any major work. Don't hesitate to write if you have questions regarding submissions and our policies.

ADVERTISING POLICY

Experimental Musical Instruments is set up to survive on subscriptions rather than advertising, but we will run ads which are potentially interesting or valuable to the readership. Please write for advertising rates.
Subscribers can place relevant classified ads of up to 40 words without charge, and they will receive a 15% discount on display ads.

EXPERIMENTAL MUSICAL INSTRUMENTS
Newsletter for the Design, Construction and Enjoyment of New Sound Sources

Editor
Bart Hopkin

Editorial Board
Prof. Donald Hall
Roger Hoffmann
Jonathan Glasier
Jon Scoville

Published in February, April, June, August, September and December by Experimental Musical Instruments.
P.O. Box 423
Point Reyes Station, CA 94956
(415) 663-1718

Subscriptions $20/year.

IN THIS ISSUE

RECORDINGS OF INSTRUMENTS APPEARING IN THESE PAGES

Written descriptions of musical instruments can never be fully satisfying. To get a sense of what a particular instrument is about, one really must hear it.

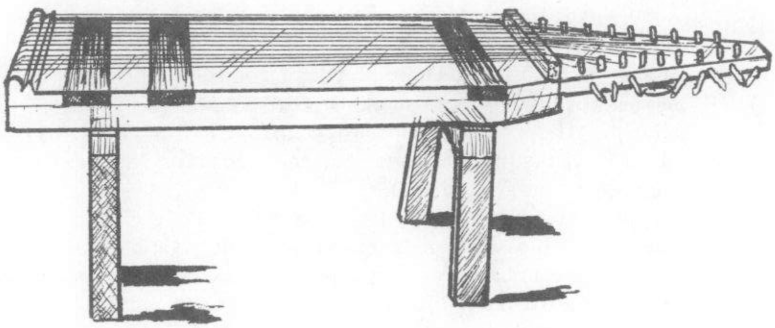
To this end, we are thinking of producing cassette recordings featuring instruments discussed in the newsletter. These would focus on instruments for which commercial recordings are not available (we give information on relevent commercial recordings and how to obtain them within the articles whenever possible). The cassettes could be made generally available and offered to subscribers at a reduced rate. Whether or not this comes to pass depends to a large extent upon reader interest in the idea, so we welcome your reactions and your suggestions as to how it might be done.

EVENTS

Because this first issue of **Experimental Musical Instruments** had to go to press very early, remarks on current events could not have been timely, so they have been omitted. In the future the newsletter will be taking note of recent and coming events in the world of new instruments.

To let us know of upcoming concerts, exhibitions, workshops and the like, write the newsletter with all the relevent information, as far in advance as possible. We will pass the news on in the next issue.

PIERRE-JEAN CROSET'S 18-STRING LYRA



LYRA

Designed and built by Pierre-Jean Croset

French instrument-builder and performer Pierre-Jean Croset was in the U.S. this spring. He came to research new instrument building in this country, and while he was here he gave some lectures and performances. An interview with him, wide-ranging and philosophical, appears in the Spring '85 issue of **Interval** magazine. (An address for **Interval** appears in the reference list on page 13.)

Croset has built a number of instruments using a crystal-clear plexiglas-like plastic, exquisitely worked. These include water drums, a sansa-like instrument and several string instruments. For practical reasons he was unable to bring most of them to the U.S. **Experimental Musical Instruments** is hoping to receive some tapes, photographs and additional information so that we can take a closer look at a few of them sometime soon. In the meantime, we can look at the one instrument Croset did bring, the instrument he most often performs on and around which his musical ideas are constructed, his eighteen-string Lyra.

It will be difficult to convey here, but the Lyra, with its body as clear as glass, its simple lines and its fine workmanship, is an extremely elegant affair.

The strings are mounted on a flat rectangular board of clear plastic, about two feet long by a foot wide; perhaps an inch and a half deep. Tuning pegs are set on a not-quite-triangular extension at one end. A guitar pickup is located under the strings near the bridge. The instrument rests horizontally on a stand a foot or so off the ground, and Croset plays it in a sitting position.

Except when the occasional open string is used, the instrument is played entirely in harmonics. On the body beneath the strings the locations of the nodes are marked in fine multi-colored lines. Croset stops the strings at the nodes with the fingers of his left hand.

With his right hand he sounds the strings, using a conventional guitar pick some of the time. At other times he uses a simple but very special device: it is a cone-shaped piece of (once again) clear plastic, about four inches long and an inch or so across the base, which has been scored around laterally with tiny serrations or grooves. This he rubs against the strings in a short tremelo motion at right angles to their length, so that its roughened surface excites them with an effect that is more like scraping than bowing.

One of the important attributes of the plastic used for the body of the instrument is its lack of acoustical life. It is one of the least resonant materials around. At the heart of Croset's musical thinking is a concern with the behavior of the string in its purest form. If the Lyra required an acoustic resonator, other materials would have to be used and would inevitably impart some of their personality to the string sound. But the guitar pickup eliminates that requirement. Using the acoustically neutral plastic for the body of the instrument, Croset is able to minimize other influences and concentrate on the innate properties of the strings themselves.

At one point Croset mentioned to me that he cannot use conventional strings because they are not manufactured to close enough tolerances. Irregularities in the diameter and mass cause the nodes to be displaced from where they should be and make the harmonics hard to play and out of tune. I thought to myself, "but I play in harmonics all the time, and that's never been a problem for me until the strings are pretty far gone." Having now heard him play, I see what he was talking about. His demands upon the strings are exacting. He uses an extreme range of harmonics, with nodes separated by fractions of an inch at times, and his just tunings for the open strings are correspondingly precise.

The Lyra tends to shape its own music. The tuning and physical arrangement of the eighteen strings determine note clusters that figure prominently in the pieces Croset plays. Having a lot of strings makes it possible to fill in the gaps in the lower part of the harmonic series, but the pitch relationships of the series remain central to the music.

STEEL CELLO AND BOW CHIMES

Designed and built by Robert Rutman

Have you ever fooled around with a thunder sheet?

Freely-suspended flexible metal sheets are wonderfully efficient resonators. Strike them, shake them, flex them; they readily produce a remarkable array of sounds. For musical purposes, though, they are hard to discipline. The sheet by itself lacks mechanisms for controlling the exuberant sound it produces.

Over the past fifteen years or so Robert Rutman has been evolving a series of instruments using flexibly-mounted sheet metal resonators with separate initial vibrators -- a bowed string in one case, and several bowed metal rods in another. The fact that the initial impulse comes from a source separate from the metal sheet allows for fuller control of the vibration but retains many of the metal's peculiar acoustic properties. The results are extraordinary.

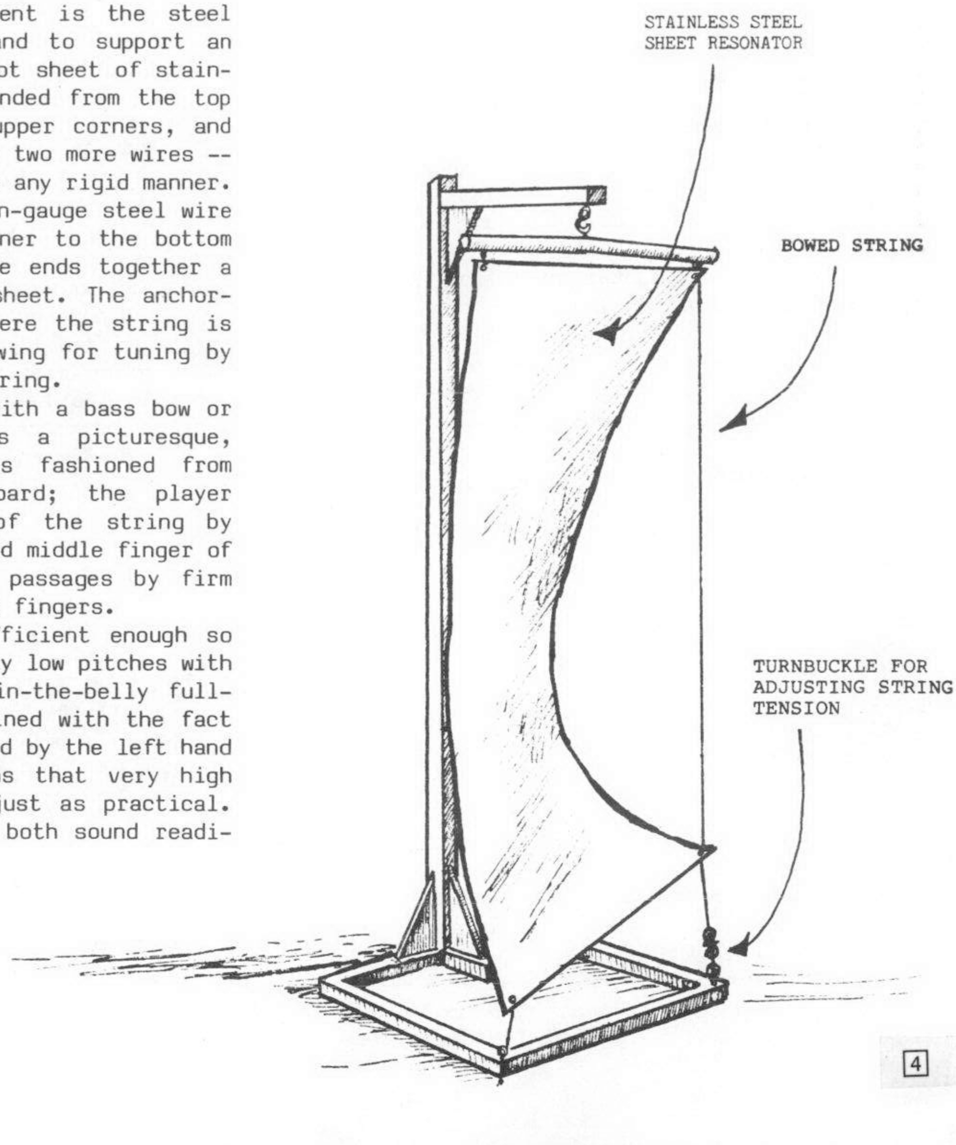
The Single-String Steel Cello

Rutman's best known instrument is the steel cello. It employs a metal stand to support an eight foot by two-and-a-half foot sheet of stainless steel. The sheet is suspended from the top of the stand by wires at the upper corners, and anchored at the lower corners by two more wires -- nowhere is it bolted or fixed in any rigid manner. The single string is an eighteen-gauge steel wire running from the top right corner to the bottom right, short enough to pull the ends together a bit, creating a curve in the sheet. The anchor-wire below the lower corner where the string is attached has a turnbuckle, allowing for tuning by adjusting the tension on the string.

The player bows the string with a bass bow or other large bow. Rutman uses a picturesque, deeply-curved bow that he has fashioned from bamboo. There is no fingerboard; the player varies the vibrating length of the string by pinching it between the thumb and middle finger of the left hand, or for faster passages by firm pressure of any of the left hand fingers.

The resonating system is efficient enough so that the instrument projects very low pitches with generous volume and a feel-it-in-the-belly fullness. The same efficiency combined with the fact that the string is easily stopped by the left hand anywhere along its length means that very high pitches speak easily and are just as practical. Harmonic tones and fundamentals both sound readily.

While the steel cello's resonator dutifully reproduces the vibrations of the string, it definitely has a life of its own as well. Under some circumstances the metal sheet develops standing waves separate from but coexisting with those of the string, producing two or more distinct simultaneous notes. The player can also bring out a larger movement in the sheet similar to the waves-crashing-on-the-shore mode of the thunder sheet, with large peaks traveling visibly over its length. With sustained bowing the string and resonator can be made to interact in such a way that wave patterns evolve and increase independent of changes in the bowing style or the way the string is stopped. All this creates a feeling that the instrument has a voice of its own; that the player is there to let it speak.

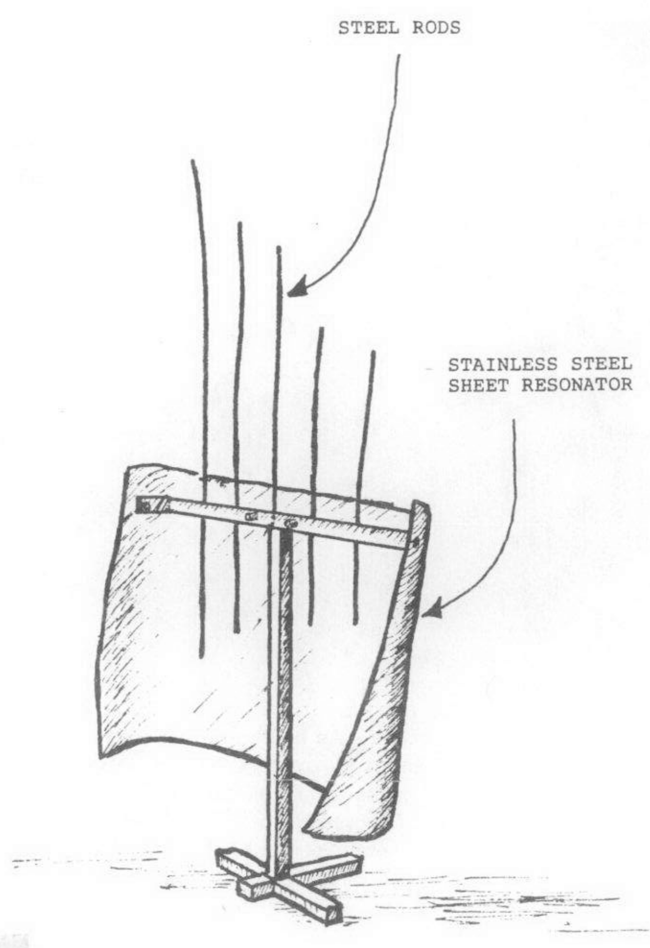


The Bow Chime

Rutman's bow chime uses five metal rods as initial vibrators. The rods are mounted upright on a horizontal bar set on a stand, attached to the bar by a mechanism which allows their length above the bar to be adjusted for tuning. The sheet metal resonator is bolted to the bar at the ends, forming a broad horizontal curve.

The player bows the rods at different points along their length with a broad, sweeping motion. The sound is controlled entirely through the bow, and, while it is not difficult to make it sing, the ability to bring out the variety of sounds it is capable of requires a lot of empathy with the instrument. Because metal rods are rich in partials, the five rods produce many more than five pitches. The overtones behave in a subtle but predictable manner, and an experienced player can learn what pitches are available and produce them at will by adjusting the pressure, speed and position of the bow.

With its innate vitality, the resonator imparts something extra to the ethereal tone of the rods. The peculiar qualities of the free resonator described for the steel cello arise here as well, but in a more constrained form, since the sheet metal is more rigidly mounted.



The Builder and the Music

Robert Rutman was born in Berlin, and has lived in England, Mexico and the US. He currently lives in Cambridge, MA, working and performing in and around the Boston area. He considers himself an artist -- a painter and sculptor -- more than a musician, and has displayed his work in galleries around the country. Rutman has built a number of other instruments in addition to those described here, and he has cultivated the Tibetan technique of chordal chanting, in which a single voice produces a second and sometimes a third distinct pitch over a very low fundamental. His performing group is the U.S. Steel Cello Ensemble.

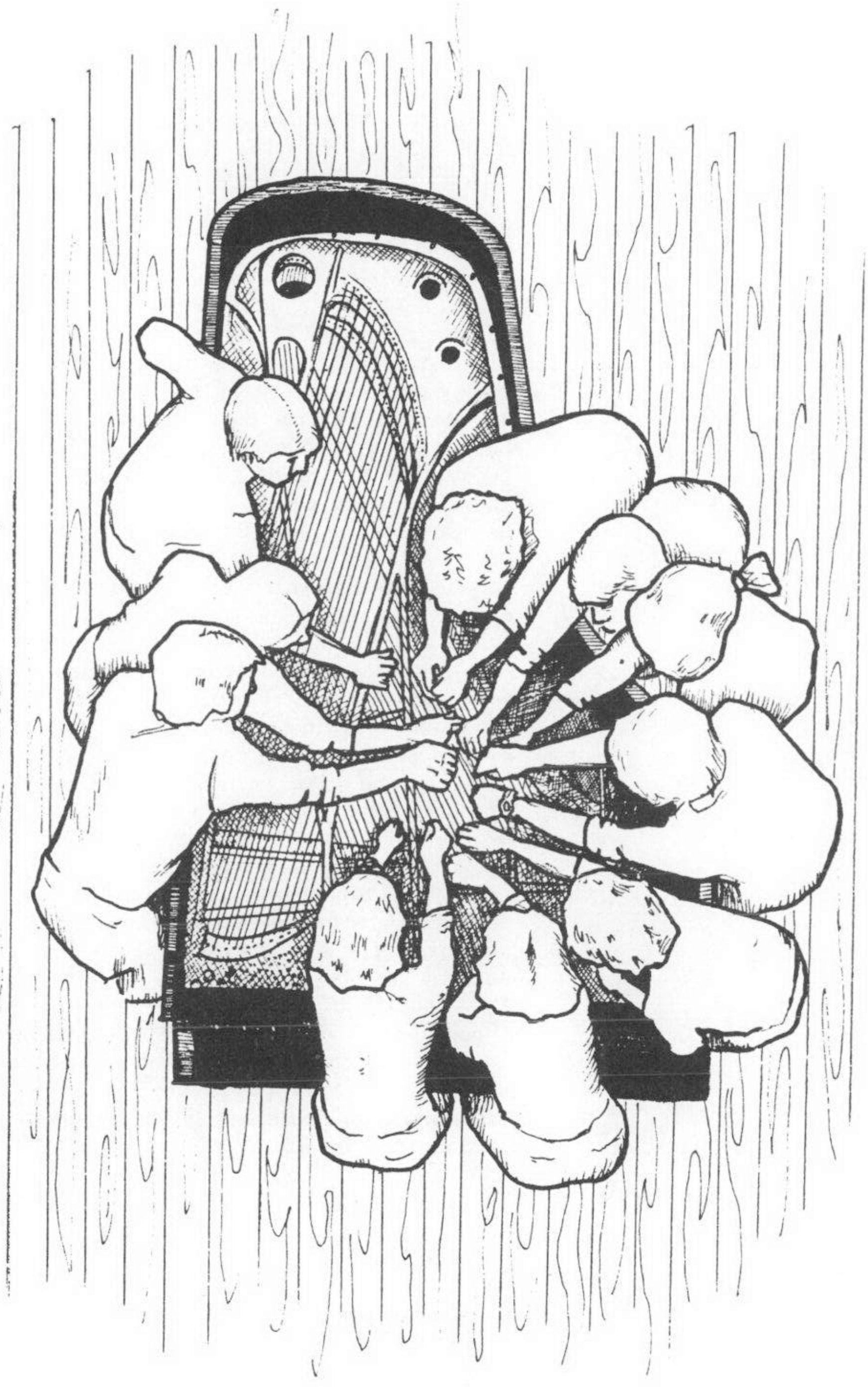
Shall I try to describe the music of his instruments? Taking a cue from Rutman's background as an artist, one could say that it has a sculptural quality to it. Dynamics, density and tone color are essential shaping elements. The ensemble's pieces tend to be long, evolving, episodic; they have a quality of bigness. The players make no attempt to use particular scales or pitches, but pitch relationships, seemingly random in one sense, are essential to the shape of the pieces as whole sections evolve around relationships between a few pitches and their overtones before moving on.

When Rutman talks about his music and instruments he passes quickly over the mechanics to focus on the relationship between the player and the instrument. New as they are and free of history, his instruments have no standard repertoire or playing technique. These things might evolve over time if people continue to play them, but for the time being their builder focuses on bringing out the personalities and possibilities of the instruments in the most flexible and sympathetic manner. He creates music for the steel cello and bow chimes not by conceiving a musical idea and applying it to them, but by doing his best to allow the instruments to suggest the content of the composition. One can hear this in the resulting pieces when what seems to speak through the wash of sound more than anything else is the emotional voice of the instruments themselves. This is not to say that the steel cello or bow chimes could not be reined in by a composer coming to them with established ideas about scale and rhythm. I suspect that the steel cello in particular could, and that the results might be very beautiful. But Rutman leaves that job to someone else.

The U.S. Steel Cello Ensemble's record, Bitter Suites, is no longer available. Some other excellent recordings do exist, and they may become available in the future...if and when that happens, Experimental Musical Instruments will let you know.

RECORDINGS

NEW MUSIC FOR BOWED PIANO
Stephen Scott
New Albion Records
584 Castro St #463, San Francisco, CA 94114
(Write for catalog and prices)



STEPHEN SCOTT'S BOWED PIANO ENSEMBLE SEEN FROM THE RAFTERS
(from a photo by Mark Reis)

The idea of bowing piano strings has been around for a while. In the liner notes for this record Stephen Scott says he first encountered it in 1976 in a piece by Curtis Curtis-Smith. It is a provocative idea: instead of a small number of variable-pitch strings which are easily accessible to the bow -- this is the arrangement for the conventional bowed string instruments -- the piano has a very large number of strings of fixed pitch with difficult access. As Scott quickly realized, the technique presented some real possibilities. It also presented some challenges.

With the help of members of his ensemble Scott developed several techniques to bring the bowed-piano idea to life, enabling him to create the pieces that make up this record. Most of them

are scored for several musicians working around one piano, in a compositional style very much suggested by the instrument itself. The pieces are thoughtful and beautiful, centered around sustained chordal clusters giving way intermittently to hocketted ostinato patterns.

Since the record appeared a few months ago Scott has continued to develop and refine his bowing ideas. Starting with the earlier methods used on the recording, here are how some of the bowed piano sounds work.

Scott began by using flexible bows made up of six or eight strands of rosined monofilament nylon, drawn between the strings of the piano to create sustained tones. When he found that these did not work well for staccato passages, he developed another style of bow, short and rigid and well suited to quick and precise playing, consisting of a popsicle stick or nail file with rosined horsehair glued to one or both sides. The first three pieces on the bowed piano record use these two types of bows.

Ensemble playing in these pieces must be carefully choreographed. Several musicians cluster around the soundboard of a lid-less grand piano for performance; their arms move around and amongst one another as they reach for the the right strings at the right times. The group does an excellent job in the performance captured on the recording, playing with clarity and precision even in the brisk hocketting passages.

For the last piece on New Music for Bowed Piano, "Resonant Resources," Scott developed a different sort of bow entirely. In fact, use of the word "bow" to describe it entails some poetic license. When I spoke to him about it recently I asked if there was a name for it. This didn't lead directly to an answer, but to a discussion of the difficulty of naming new instruments. Eventually, though, he did come up with a couple of names by which it has been called -- Piano Resonator and Electromagnetic Bowing Device.

Conceptually, the Electromagnetic Bowing Device is something like a reverse guitar pickup. It is related to the E-bow, a device with which some readers might be familiar used to enhance the sustain of electric guitars. Scott's system consists of a set of electromagnetic coils suspended just above the strings of the piano. A digital oscillator continuously sends a current to each coil. The rate of oscillation of the current sent to a given coil corresponds to the rate of vibration of the string over which that particular coil is located. As long as that string's damper is in place, the string does nothing. But when the damper is lifted, the metal string begins to vibrate in sympathy with the magnetic impulse generated by the current in the coil, and the resulting sound is naturally transmitted through the soundboard of the piano. This is the process that Scott refers to as electromagnetic bowing.

To play a piano with the electromagnetic bows in place, the pianist silently depresses the keys he wants to sound, which lifts the dampers. He can still strike the keys in the usual fashion as well. "Resonant Resources" incorporates both modes of playing. The device does not require modification of the piano beyond removal of the lid. It can be moved from one piano to another, and Scott has concertized with it on several different instruments. The sound produced by a piano under the influence of an Electromagnetic Bowing Device is entirely acoustic. That is to say, while electronic hardware plays a role in exciting the string, the sound that one actually hears is that of the acoustic coupling between the string and the soundboard, unenhanced.

The most striking aspect of the electromagnetic bowing sound is the envelope: it is the reverse of that of the struck piano string. Starting from nothing, it increases in volume gradually until it abruptly ends at the moment when the key is released and the damper falls back in place. Scott often uses a technique involving releasing the damper gradually. As it initially makes light contact with a string which, because of its electromagnetic environment, wants to keep vibrating, it creates a peculiar buzz. This draws the listener's attention, ironically, to the note being stopped. Between this and the backwards envelope, the electromagnetic bowed piano piece creates a peculiar temporal reversal, in which the ends of notes tend to become more important than the beginnings.

The electromagnetic bow used in the "Resonant Resources" recording was relatively primitive. It covered only a small part of the piano's range, and the oscillating frequencies, once set prior to the start of a piece, were not readily adjustable. Alex Stahl, a former student of Scott's and a member of his ensemble, is now developing a more sophisticated version. The new instrument has an extended range and more versatile electronics. It will have a second keyboard which will allow the player to control the frequency sent to each electromagnet. This will make it possible to select harmonics of the strings at will and to vary them during performance. The instrument should be ready for some concerts at diverse locations around the country planned for this summer.

Anyone interested in knowing more about the Electromagnetic Bowing Device can contact Stahl at 1917 48th Ave., San Francisco CA 94117.

TOOLS & TECHNIQUES

TUNING DEVICES

This article gives a rundown of the different types of tuning aids available, how they are used, what they cost, and where to get them. We are indebted for much of the information to Spencer Brewer, piano tuner par excellence.

Most instrument builders have to deal with tuning on a regular basis. We start out tuning by ear, most of us, because an electronic tuner is a big investment. In many cases tuning by ear is quite adequate, especially if the builder has developed the skill over a period of time. After all, most piano tuners still work by ear, by choice. They tune by listening to beats. This method is very precise, and formulas for accurately tuning common scale systems by beats are generally available. (Beats are regular fluctuations in volume of sound resulting from two simultaneous vibrations of close but not identical frequencies.) But there are plenty of instances in which tuning by ear is difficult, even for someone with a trained ear. Many idiophones, membranophones, wind instruments with irregularly shaped bores and strings of non-uniform diameter contain upper partials bearing little relationship to the familiar harmonic series. With metallic vibrators especially, these overtones can be very strong, sometimes more prominent than the fundamental. The ear finds it difficult to isolate a particular tone as **the** note in these cases. To add to the confusion, such instruments can produce "false beats," which are beats caused by interference between overtones of a single vibrating body, making tuning by beats difficult.

Electronic tuners reduce the subjective element and make these situations more manageable. Even for instruments producing relatively pure tones they can be quicker and more convenient than ear tuning. They also provide helpful reassurance and some educational feedback for anyone who doesn't already know everything there is to know about tuning.

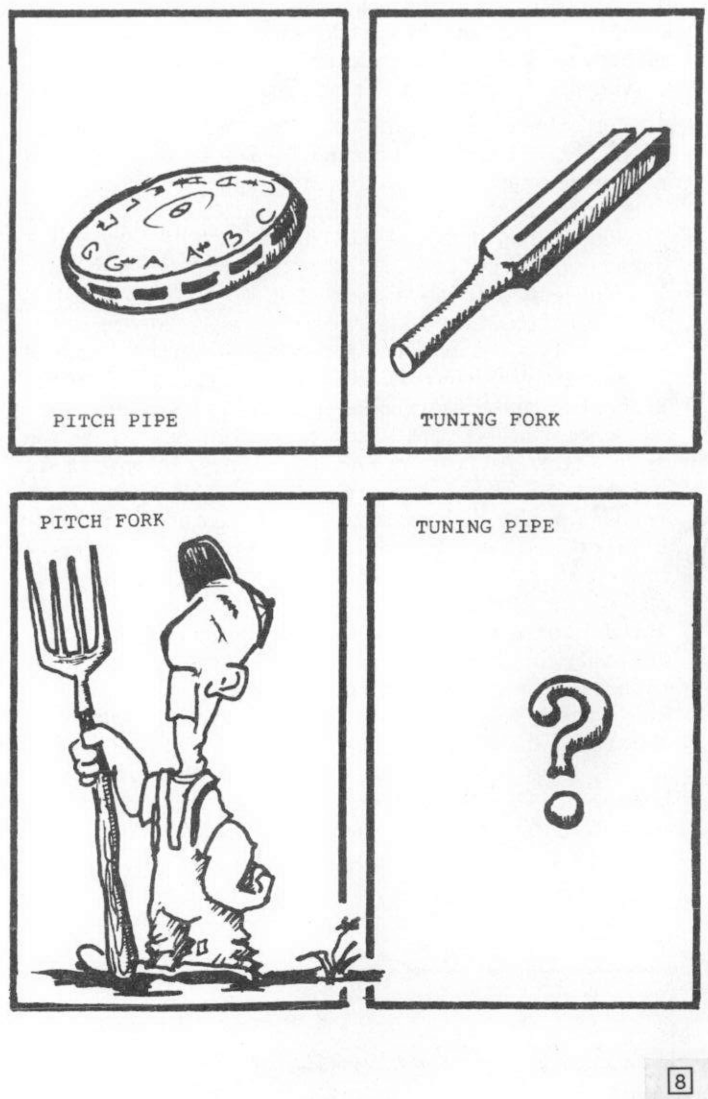
Let's look at some of the different types of tuning devices that are now available. At the end of this article you will find approximate prices for the items discussed and the names and addresses of some suppliers.

Pitch Pipes and Tuning Forks

You can tune an instrument to itself without reference to any outside pitch standard. If you want to tune an instrument to concert pitch, though, you will need something to provide a reference pitch as a starting point, even if you tune by ear from then on.

Pitch pipes do not do the job. They use free reeds like a harmonica, and as with a harmonica the reeds go out of tune when they become corroded or fatigued or just damp. Plus, as every blues harpist knows, their frequency varies with air pressure. They also tend to have prominent overtones which confuse the tuning process.

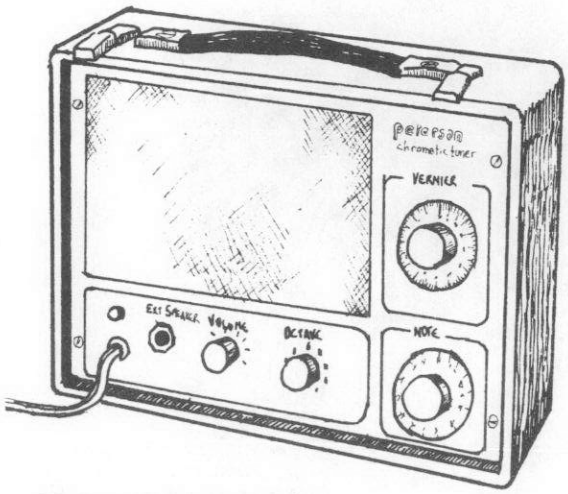
Tuning forks do not go out of tune unless they get chipped. Single tuning forks tuned to A at 440 cycles per second (the most widely-used modern pitch standard) or C-512 are inexpensive and readily available. Tonometers, which are sets of thirteen forks tuned to the pitches of an equally-tempered octave, are also available. (12-tone equal temperament is the most common intonational system in use today, though by no means the only one.) Tuning forks normally must be held against a resonating surface to be audible, which is inconvenient. One way around this is to hold



the handle of the fork in your teeth, which provides a very clear tone through bone conduction and frees the hands for tuning work.

One can also get tuning bars, comprised of a single tuned metal bar mounted over a resonator and struck with a beater. They have the advantage that they resonate audibly for a long time on their own, and need not be held.

The disadvantage of tuning forks and bars is that they cannot provide a continuum of pitches. If you don't choose to tune to standard pitch or don't believe in equal temperament, you enter a no-man's land between the available pitches of the chromatic set.



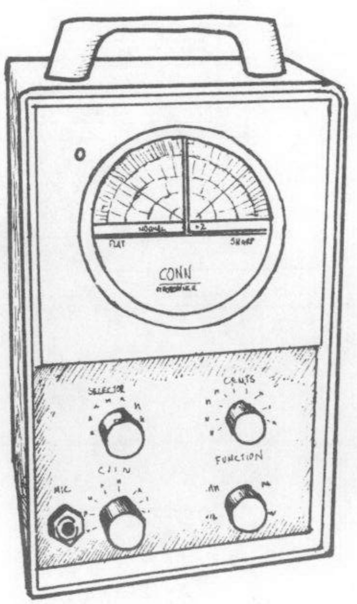
ELECTRIC AUDIO TUNER

Electronic Audio Tuners

Electronic audio tuners produce an electronic tone to be used like that of a tuning fork for tuning by comparison. The better ones cover a range of seven or eight octaves and have continuously variable pitch. A knob on the front of the tuner selects the octave of the output note; another selects one of the twelve chromatic note names. A third, the Vernier pitch control, can adjust the pitch selected by the other two up or down by up to half a semitone, calibrated in cents. (One cent = 1/100th of a semitone.) A frequency-to-cents chart enables one to identify the frequency of any pitch selected or to select a pitch of any frequency.

Strobe Tuners

Stroboscopic tuners convert audible pitch information to a visual readout. A microphone picks up the sound of the instrument being tuned and sends the signal to a small light inside the tuner which flashes at the frequency of the sound. The light illuminates a rotating disk printed with a carefully-designed pattern of lines, visible through a window in the casing of the tuner. When the speed of rotation is such that the frequency with which lines pass a given point equals the frequency of the flashing light, the lines appear to stand still. A correspondence is thus established between the speed of rotation and pitch. Knobs on the tuner control the speed of the disk; they are marked with pitch names. As on audio tuners, one knob selects one of the twelve equally-tempered notes, and a Vernier pitch control knob makes adjustments to up to fifty cents sharp or flat. To tune a string to B flat, one sets the knobs for B flat, then sounds the string and, watching the wheel all the while, adjusts the tuning of the string until the lines on the tuner's readout appear to stop moving. To identify the pitch of a string, one plays the string and then adjusts the knobs until, again, the lines are still. The pitch can then be read from the knobs.



STROBOSCOPIC TUNER

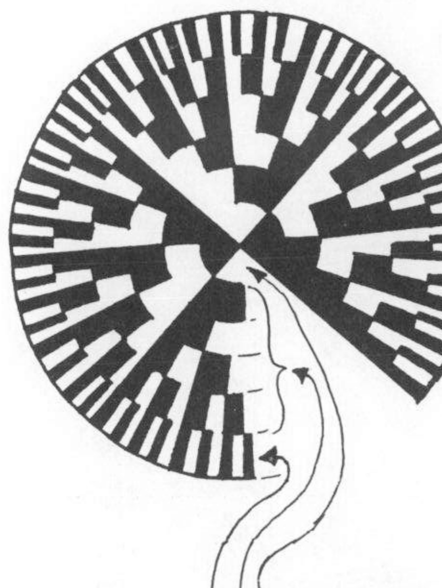
There is no octave selection knob on the strobe tuner. The seven or eight octaves readable on most strobe tuners are represented by concentric levels on the rotating disk. This effect is achieved by making the lines for each succeeding octave half as wide (actually half as many degrees of the circle) as the octave below. This means that twice as many lines pass by a given point for a given speed of rotation, and they will stand still at twice the frequency of flashing, corresponding to the octave.

Reading the tuner -- that is, identifying when the lines are standing still -- is not always as easy as it would seem. Especially for sounds with prominent or irregular overtones, the lines just don't seem to cooperate sometimes, and it takes practice to make sense of these ambiguous situations.

The most expensive tuners have twelve disks which operate simultaneously. This allows for separate simultaneous readout for each of the chromatic semitones and eliminates the need for manual adjustment to go from one note to the next. Twelve-wheel readout assumes the user's allegiance to an equally-tempered scale, since the pitch control adjusts all twelve wheels in tandem -- one cannot alter the relative tuning between the wheels.

Some strobe tuners have both visual readout and all the features of an audio tuner.

STROBE TUNER DISK

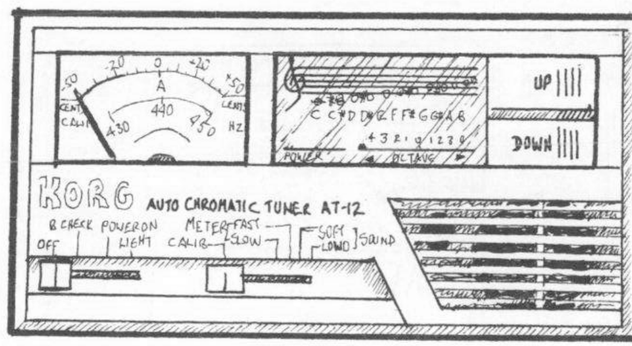


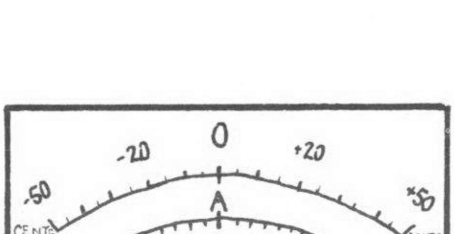
The lowest octave is read from the innermost circle
Progressively higher octaves appear on progressively larger circles
The highest octave is read from the outermost circle.

Meter-Readout Tuners

Recently some tuners have appeared which replace the rotating disk with internal electronics which generate a meter readout. These range from six-note guitar tuners to instruments with the full range response and audio tuner functions as well. The meters are calibrated in cents up to fifty cents sharp or flat of a central point marked 0. The tuner responds to the sounded tone in three ways: an LED lights up under a number indicating the octave of the sounding pitch; another lights up under the pitch-name of the equally-tempered note nearest the sounding pitch; and the needle in the meter moves to a point indicating cents sharp or flat of that nearest note. A system for adjusting the pitch standard between A-430 and A-450, a range of about a semitone, is provided. All the pitch functions in the machine are locked into an equal temperament relationship to the pitch standard that has been set, but the cents reading on the meter helps alleviate this limitation.

Like all the other tuners, including the ear, meter tuners have difficulty with prominent harmonics. In cases where they cannot make sense of the input they simply don't respond. In borderline cases the tuner sometimes gives a response so transient as to be unreadable, especially since the eye must pick up three signals (octave, note name and meter readout) separately. They do work





METER-READOUT TUNER AND A CLOSER LOOK AT THE METER

well for very brief sounds of clear pitch, because a hold mechanism causes the meter to retain the reading for a few seconds after the tone has passed.

Improving the Performance of Electronic Tuners

With both meter and strobe tuners you can improve performance by giving the tuner the clearest possible signal. Most electronic tuners come with both an internal microphone and an external microphone input jack. By using an external mike with enough chord you can get the mike very close to the sound source and obtain a stronger signal. Moreover, you can sometimes select which tone from a harmonically rich sound will predominate and reduce the effect of overtones which confuse the tuner, by taking advantage of the fact that different overtones emanate more strongly from different parts of the vibrating body. Trial and error will show whether holding the mike very close to one location or another on the resonating surface produces a signal which is easier for the tuner to interpret.

The mike input can also take the signal from a transducer. Transducers are pickups which respond to vibrational movement in a sounding body in the same manner that a microphone responds to sound waves in the air. They are made to be stuck onto a vibrating surface by means of a putty-like glop. Usually they go on the bridge or soundboard of a string instrument, but they will work directly on vibrating rods or tubes, marimba bars and the like. Frequently they seem to give the tuner a clearer signal than a mike does. They also provide greater control in selecting overtones, since the transducer responds specifically to the vibrations occurring in the spot where it has been struck. On the downside, the weight of the transducer and its chord can damp the vibrations considerably, and may affect the frequency.

You also can help tailor the input to the tuner's needs simply by altering how you sound the instrument being tuned. How, where and with what you strike, pluck, bow or blow has a substantial impact on the overtone content of the resulting sound.

A Final Point

Have you ever had the disorienting experience of listening to a distant carillon, or some exotic organ stop, and realizing after a few bars that you have been listening to a melody of overtones quite unrelated to anything the player intended? People who have tuned difficult instruments know that you frequently can change a sound just by changing your psychological orientation, or even by turning your head. It also appears that some people are disproportionately sensitive to certain pitches or pitch ranges, possibly for physiological reasons, making some pitches and overtones jump out at them. The point here is, tuning turns out to be a more subjective matter than might be expected. Inserting an electronic tuner into the procedure provides some objectivity, but it does not eliminate listeners' idiosyncratic responses. This is especially relevant for readers of this newsletter, who are likely to be working with unusual sound sources and peculiar overtone recipes.

Purchasing Tuning Equipment

Purchasing information follows for the items discussed above. Prices given are approximate and, of course, subject to change. And they vary dramatically, often more than 100%, from one distributor to the next.

It is helpful in dealing with the supply houses listed below if you either write on some sort of official stationary or send a business card indicating a professional involvement with the products they sell. They will send a catalog only if they believe you will buy enough in the long run to make it worth their while. Not unreasonably, some charge for their catalogs. But get the catalogs if you can: they make fascinating browsing, and you will surely find things you always needed but had not known were available.

<u>Where to look for what:</u>

Individual tuning forks are available at retail music stores and through mail order music supply houses. Sets of tuning forks (tonometers) and tuning bars are available through piano supply houses. Electronic tuners are available through both general or educational music supply houses and piano supply houses.

<u>Prices:</u>

Tuning forks and bars (Ludwig and Deagan are good brands):
- Individual tuning forks: $2 to $14
- Tonometers: $70 to $300
- Tuning bars: $55

Electric audio tuners:
- Peterson 70 (one fixed octave only): $170
- Peterson 300 or 320 (8 octaves continuously variable): from $235

(continued)

Strobe tuners:

- Conn ST-11 (currently the most popular model): from $290
- Peterson 400 and 420: from $450
- Peterson 450: from $205
- Node Type 7050 (12-wheel; distributed by Peterson): from $2525
- Peterson 520 (with full audio capacities): from $410

Meter-readout tuners:

- Arion HU-8400 (chromatic, but standard pitch is not adjustable): $50
- Korg AT-12 (with full audio capacities as well -- **this is probably the best bet on a low-priced electronic tuner**): from $105
- Several companies manufacture 6-note guitar tuners with varying features, ranging in price from $25 to over $150.

Mail order supply houses:

These two general and educational music supply houses have unbeatable prices and excellent selection:

Interstate Music Supply
P.O. Box 315
New Berlin, WI 53153

National Music Supply
P.O. Box 14421
St. Petersburg, FL 33733

Piano supply houses generally prefer to deal only with professional tuners and technicians. Their prices tend to be higher than the educational houses mentioned above. More piano supply houses can usually be found in local telephone and business directories.

Tuners Supply Company
88-94 Wheatland St
Somerville, MA 02145
Catalog: $5

Pacific Piano Supply
11323 Vanowen St
North Hollywood, CA 91609
Prices here tend to be high.

ORGANIZATIONS & PERIODICALS

A REFERENCE GUIDE

There are a lot of associations and organizations whose work is potentially interesting to new instruments people. Many of them are membership organizations, and many produce a periodical publication of some sort. In this first issue of **Experimental Musical Instruments** we provide a listing of a number of these groups. Separate articles on many of them, with more complete information, will appear in the future.

There are undoubtedly many organizations not included here that merit mention. If you know of or are part of a group that readers of the newsletter could benefit from, let us know and we will add it to an updated list.

The Acoustical Society of America
335 E 45th St, New York NY 10017
Association for professional acousticians, highly technical in its orientation. Publishes the monthly **Journal of the Acoustic Society of America**; sponsors conventions and symposiums. Has a Musical Acoustics Committee. Associate membership is available for non-professionals at $38 per year.

American Gamelan Institute
Box 9911, Mills College Station, Oakland, CA 94613
(Gamelans are traditional orchestras of Java and Bali made up primarily of gongs and metallophones.) Dedicated to both Indonesian Gamelan music and the growing American Gamelan movement. Publishes **Balungan** three times per year, subscriptions $8 for individuals.

American Musical Instrument Society
Box 194, University of South Dakota, Vermillion, SD 57069
AMIS Membership Office: c/o Shrine to Music Museum, 414 E Clark St Vermillion, SD 57069
Devoted to the study of musical instruments; scholarly and primarily historical in its orientation. Publishes the **Journal of the American Musical Instrument Society** and three newsletters annually. Sponsors conventions; is affiliated with the Shrine to Music musical instruments museum and reports on other instrument collections. Membership $20/year.

Catgut Acoustical Society
1112 Essex Ave. Montclair, NJ 07042
Violin Acoustics. Publishes the semi-annual **Catgut Acoustical Society Journal.**

Center for Music Experiment
University of California at San Diego, Box 109, La Jolla, CA 92093
Not a membership organization, but it does produce an annual report. UCSD has been a center for activity in new instrument building.

Ear Magazine
325 Spring Street, Room 208, New York, NY 10013
There are several fine publications devoted to new music; this one is mentioned here because it tends to feature new instruments quite a bit. Issued five times a year, subscriptions $12/year.

Folk Harp Journal
P.O. Box 161, Mt. Laguna, CA 92048
A quarterly publication devoted to every kind of harp, frequently featuring articles about harp making and harp makers. Subscriptions $12.

Galpin Society
38 Eastfield Rd, Western Park, Leicester LE3 6FE, England
The British equivalent and predecessor of the American Musical Instrument Society. Publishes the **Galpin Society Journal** annually.

Guild of American Luthiers
8222 South Park Ave. Tacoma, WA 98408
For makers and repairmen of stringed instruments. Publishes **American Lutherie**, formerly **The Guild of American Luthiers Quarterly**, and supplemental materials. Sponsors conventions, workshops and the like. Membership $25/year.

Interval Foundation
3932 Alameda Pl., San Diego, CA 92103
Concerned primarily with alternative tuning systems and microtonality, but it is by far the best resource for activity in new instrument building going back several years. Publishes **Interval/Exploring the Sonic Spectrum** more or less quarterly; sponsors various events and shows. Subscriptions $12 for four issues.

Journal of Guitar Acoustics
Box 128, Grass Lake MI 49240
Published quarterly.

Just Intonation Network
535 Stevenson St., San Francisco, CA 94103
Concern with just intonation often leads to concern with new instruments capable of playing in just intonation. Publishes **1/1** quarterly; sponsors concerts and lectures. Membership $15/year.

Lark in the Morning
P.O. Box 1176, Mendocino, CA 95460
A retail music store that is far more than a retail music store. Publishes **The Lark's March** newsletter and a catalog full of esoteric traditional instruments; sponsors workshops, summer camps and the like.

National Association of Professional Band Instrument Repair Technicians
Box 51, Normal, IL 61761
Professional organization for wind and percussion instrument repair people. Publishes **Techni-Com** six times a year; sponsors conventions and workshops. Supporting membership is $60 per year plus a $15 initiation fee.

Percussive Arts Society
214 W Main St., Box 697, Urbana, IL 61801
Publishes **Percussive Notes** six times a year. A large organization, with local chapters. Percussionists tend to be the most adventurous instrumentalists when it comes to working with new instruments; their umbrella organization often reflects this. Membership $20.

Society for Ethnomusicology
P.O. Box 2984, Ann Arbor, Michigan 48106
Scholarly association devoted to the study of world musics. Publishes quarterly **Journal of the Society for Ethnomusicology**; sponsors conventions and symposiums.

NEW MUSIC AMERICA 1986

Preparations are under way for New Music America 86, and -- big news! -- there will be an emphasis this coming year on new instruments. The eighth annual New Music America festival will be held in Houston from April fifth to thirteenth, 1986. From their news release:

New Music America 1986 will highlight current developments in new instrumentation including: new uses of traditional instruments, new uses of new instruments (both acoustic and electronic), invented instruments, sound installations, and sound environments. More than 100 artists, composers and musicians are expected to participate.
New Music America 1986 is open to all artists and musicians living and working in the United States. The works will be screened by a selection committee chosen from local, regional and national figures in the area of new music. This committee will be chaired by Pauline Oliveros, who is the artistic advisor of NMA '86.

The due date for submitting proposals to the selection committee is June 1, 1985 -- too soon, unfortunately, for most people reading this. For more information, the address of the festival offices is 1964 W Gray Suite 227, Houston, TX 77019.

BOOKS

TONY PIZZO'S FORTHCOMING BOOK ON INSTRUMENT BUILDING WITH AVAILABLE MATERIALS

Vermont builder and designer Tony Pizzo is presently working on a book of instrument designs, tentatively titled **The Maker-Played Instrument**, scheduled to be published by Scribner's in about two years. He writes:

The designs appearing in the book are primarily adaptaions of string and percussion instruments from South America, Africa, and Asia, and substitute available materials such as #10 cans, pvc tubing, spruce 1"x3", masonite and steel music wire for the gourds, bamboo, hardwoods and gut used in the model instruments.

Over the course of my seven years as an adult workshop leader and artist-in-the-school, I've found the discipline of purposely limiting my materials to the simplest and most easily available has been one of the most challenging and enjoyable aspects of my work. Available-material instrument construction enables people who have had no experience in instrument making to understand the basic methods and materials which have taken present form in the instruments more familiar to them, while at the same time suggesting practical possibilities for experimentation.

In my book I intend to include plans for instruments which have previously not appeared in book form, such as the kora (African harp-lute), the gopichand (Pakistani string drum), rabab, ukelele and tamboura, as well as refinements of more popular instruments like the kalimba, slit drum, koto, and assorted musical bows, drums and psalteries.

****

In connection with this work, Pizzo is looking for information on contruction, playing technique and tuning of the didjeridoo and the dousso n'koni or doussn'gouni, an African hunter's harp. If you can help, write him at R.F.D. 1, Lunenburg, VT 05906.

THE NEW GROVE DICTIONARY OF MUSICAL INSTRUMENTS
Stanley Sadie, Editor
Grove's Dictionaries of Music, New York
$350.00

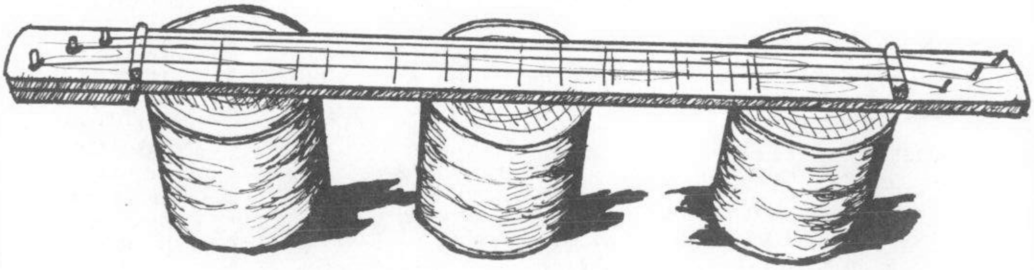
With its three volumes, this is the most complete musical instruments dictionary/encyclopedia in existance. The high price -- presumably justifiable -- may have prevented its becoming more widely available since its publication last Fall, and I have not yet been able to see it, but it is a terribly important new publictaion and merits a few words here prior to a full review later.

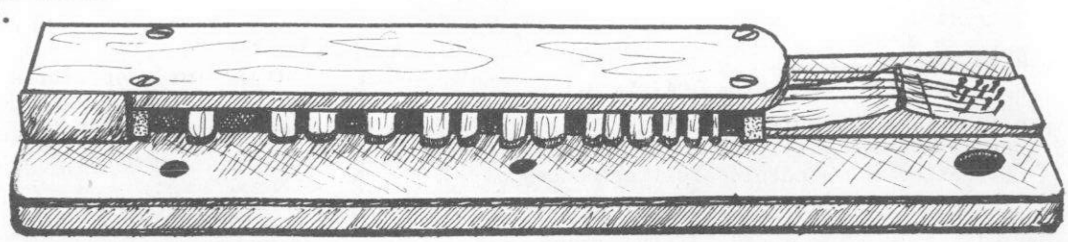
For the first time, we have here a general musical reference work which takes a serious look at new instruments. Hugh Davies of London did most of the research and writing on new instruments for the dictionary. He reports that it includes over three hundred entries on 20th century instruments, comprising in length about 6% of the total dictionary. Included are extended articles on electronic instruments, sound sculpture, microtonal instruments, sound effects, and modifications and new techniques for conventional instruments, among many other topics.

No general reference work devoted to new instruments exists right now, though the subject cries out for it. Grove, the publishers of the dictionary, have occasionally produced paperback spinoffs from larger works in the past. The material in this new dictionary might provide a very good basis for such a spinoff in a moderately-priced encyclopedia of new instruments -- it certainly would be welcome. In the meantime, we have this larger work, and it is a big step forward.

****

Two of Pizzo's available-material instrument designs: stick zither above and bulbul tarang, an Asian mechanical dulcimer with spring-activated keys and twelve steel strings, below.





VOICE MODIFIERS

Experimental Musical Instruments would like to hear from anyone working with voice modifiers -- that is, instruments which take the human voice as an initial sound source and alter or add to it.

Instruments of this sort occupy an ambiguous position. They are difficult to place in the common categories of musical instruments, and, in our part of the world at least, people usually regard them as toys and novelties. But there is potential here. Taking the most human of sounds and displacing it in some way produces a peculiar emotional effect. The disorientation is often humorous, but it can produce a range of other responses as well. Electronic devices for this purpose have been appearing quite a bit recently in pop music and some not-so-pop music, sometimes quite successfully -- as in much of Laurie Anderson's work.

Some thoughts and background on the subject of acoustic voice modifiers follow below. These notes are fragmentary, preliminary, not thoroughly researched. They are presented in the hope that readers will help fill them out. Please write the newsletter if you have anything to add, especially regarding current work in this area.

The most common voice modifiers are mirlitons, including kazoos, zobos, comb-and-tissue-paper and like devices. A kazoo is a small tube with a membrane-covered opening part way along its length. When one sings through the tube the membrane rattles; the resulting sound is a combination of the membrane sound and the natural voice. Zobos, which were popular for a while early in the century, were essentially kazoos whose external shape replicated in miniature some more respectable instrument like trumpet or trombone. Their membrane mechanisms were designed to generate a sound reminiscent of the instruments they resembled. How successful they were at this I cannot say, but the idea that one could customize a kazoo to produce a particular kind of sound is intriguing....

I am not aware of anyone currently working with mirlitons in any context other than fun and novelty. Within this context, though, there are a number of kitchen bands scattered around the country raising Cain. Some have enhanced their instruments with various types of tubes and funnels to further modify the sound. There is an organization in Rochester, NY, called Kazoophony, which is lobbying to make the kazoo the official American national musical instrument.

One can also enhance the voice with selected additional resonances through sympathetic vibration. Any tuned vibrator, be it string, membrane or rigid material, will sing along with a voice sounding nearby when the frequencies of the fundamentals or of prominent upper partials coincide. Readers might know composer George Crumb's work, "Ancient Voices of Children." In it he directs a soprano soloist to sing directly into the strings of a piano with the dampers lifted. Each of her notes calls up a sympathetic response in any strings whose fundamentals or overtones agree with those in the voice; those strings continue to resonate after the vocal note has passed. The result is more musical than gimmicky, I think, though it looks awkward in performance.

Voice modifiers can also be built around resonating chambers designed to reinforce certain aspects of the vocal sound. Face masks used in drama and ritual often work this way. If the designer is concerned only with resonances and can forget about masks, the possibilities are greater. It is not hard to imagine a set of intelligently-designed vocal resonating chambers. There is an Eskimo children's game which uses the same principle: pairs of girls sing in a stylized fashion into one another's mouths, bringing both oral resonating cavities into play. The resulting sound, other-worldly even as at is profoundly, disturbingly human, is astonishing -- no exaggeration.

EXPERIMENTAL MUSICAL INSTRUMENTS

Subscription Form

Subscriptions are $20/year for 6 issues. Enclose your check or money order along with this form and return them to Experimental Musical Instruments, P.O. Box 423, Point Reyes Station, CA 94956. If after receiving Experimental Musical Instruments you are not satisfied with your subscription for any reason, your money will be refunded in full.

Name ______________________________

Address ______________________________

City, State, Zip ______________________________

If you know of others who should hear about Experimental Musical Instruments, please write their names and addresses below and we will send them a copy of this letter.

A NEW INSTRUMENT AT THE EXPLORATORIUM -- THE PENTAPHONE

Jonathan Glasier, editor of **Interval** magazine and a member of the editorial board of this newsletter, recently completed a stint as artist-in-residence at the Exploratorium, where he built a new instrument for exhibition. For those not familiar with it, the Exploratorium is San Francisco's hands-on science and technology museum. It's a great warehouse of a place, filled with more exhibits than one could possibly get through in a day, all of them participatory and most of them fun and interesting. It always has a not-quite-finished feeling to it, with this being built and that being torn down and the roof repairs not yet completed after how long now...a suitable atmosphere for exploration.

Glasier's new instrument, which he has named the Pentaphone, is all fives. It is made up of five sets of tuned bars, each using a different material for the sounding bars, each with its own characteristic timbre, but each tuned to the same pentatonic scale. A pair of beaters of the right hardness for each material is kept alongside the bars they are intended for. The beaters are chosen and the instrument built in such a way that it can absorb enthusiastic performances by the visitors to the Exploratorium without being damaged or producing harsh or distorted sounds. In the best Harry Partch tradition, the instrument has a sort of geometric beauty, with each set of bars occupying one side of a pentagon in a slightly-skewed symmetry.

One set of bars is paduk, a beautiful reddish wood very similar to rosewood in its acoustic properties but more moderate in cost, since it is less in demand. There are tube resonators beneath. This one-fifth of the instrument produces a rich marimba sound.

To the right are the bamboo bars, the only ones without resonating tubes. Their sound is all bright and percussive with no sustain, very much contrasting with the tone of the other materials.

Two sets of metallophone bars follow -- magnesium and aluminum. The larger magnesium bars produce the fuller sound; both produce a pure tone of minimal overtone content and very long sustain.

The fifth set uses slabs of travertine marble, a material first used for tone bars by Robert Ericson at UC San Diego in 1968. The open grain of the stone makes for a smattering of small breaks and holes, quirky and irregular in shape and intriguing to the eye, in the polished surface of the slabs. The tone of the marble, like that of the metals, is rather pure, but with a subdued quality and a softer attack.

In a manner reminiscent of ancient Chinese thinking about pentatonic scales, Glasier has arranged a symbolic system of shapes and colors to express the relationships between the pitches of the bars of different materials. The colored shapes appear above each bar of each set.

The instrument is located inside a tiny pagoda-like wood-and-glass room of its own. As long as the Exploratorium is open, the room is filled with people, all Orff-illy playing away in the same pentatonic scale. As a rule, the individual players have little regard for what other members of the ensemble are doing, and the result is a sweet hodgepodge of pentatonic sound.

Experimental Musical Instruments
P.O. Box 423
Point Reyes Station, CA 94956

BULK RATE
US POSTAGE PAID
Pt. Reyes Station
CA 94956
Permit #15

TO: